INSTRUCTION MANUAL

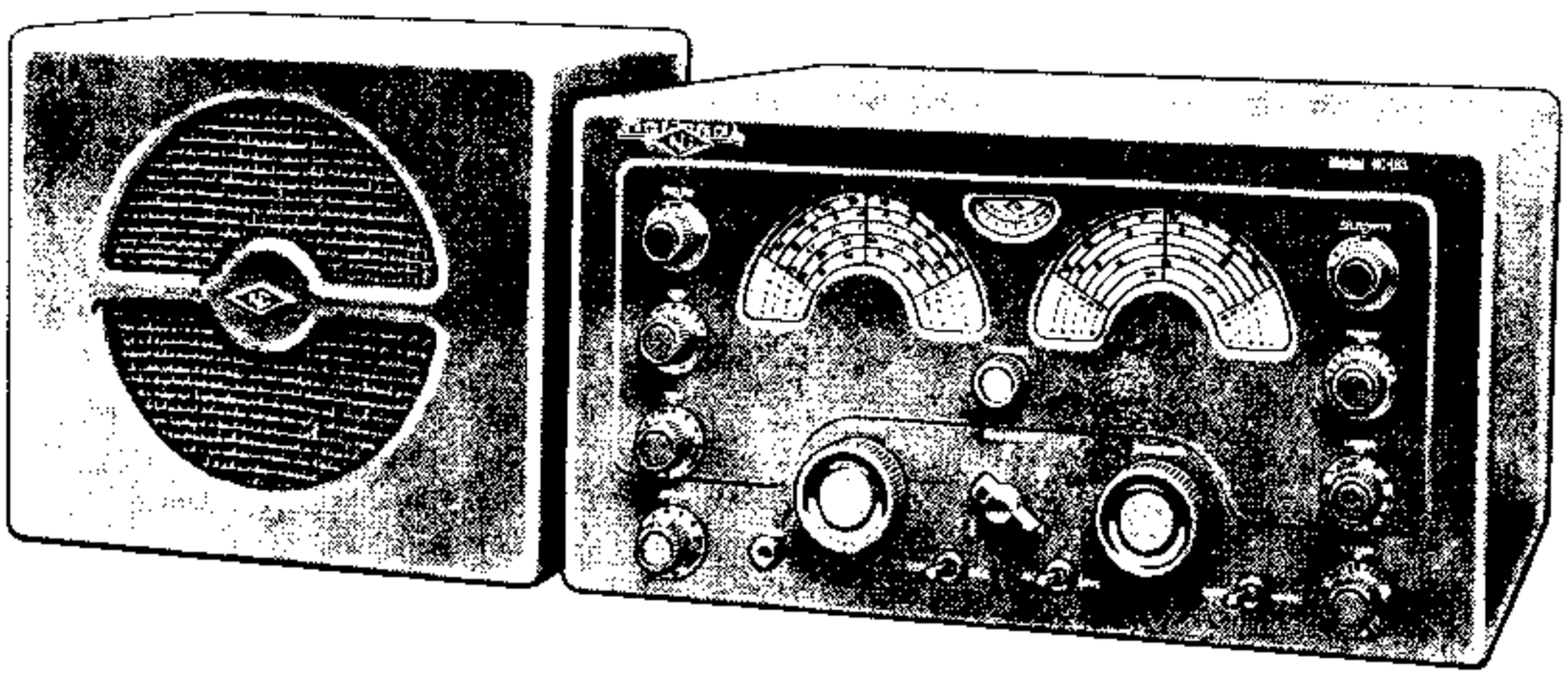
for

THE NATIONAL NC-183

RADIO RECEIVER

A Receiver designed to combine performance and versatility "plus" for the critical user.

National



NC-183 RECEIVER

FEATURES . . .

- 0.54 to 31. mc. plus 48-56 mc. Frequency Coverage.
- Calibrated Amateur Band Spread for 6, 10-11, 20, 40 and 80 meter bands.
- Two R. F. Amplifier Stages for Excellent Sensitivity and Image Rejection.
- Double-Diode Noise Limiter Effective on Both Phone and C. W. Reception.
- A Wide Range Crystal Filter with 6 uniform steps of selectivity variation.
- A. V. C. for Both Phone and C. W. Reception.
- S-Meter with Adjustable Sensitivity for Phone and C. W. Reception.
- Stabilized Voltage Regulated Circuits.
- Accessory Connector Socket.
- Push-Pull Audio Output Stage.
- Phonograph or Microphone Input Jack.
- Loud-Speaker in Matching Cabinet.

National Co., Inc.

THE NC-183 RADIO RECEIVER

SIMPLIFIED OPERATING INSTRUCTIONS

1. *Operating Instructions*

Operating instructions for the NC-183 Receiver are presented here in a non-technical manner to enable those persons not familiar with a communications-type Receiver to operate the NC-183 efficiently with a minimum of effort. To obtain the maximum in listening pleasure it is recommended that these two pages are thoroughly read before operation of the NC-183 is attempted, although no damage to the Receiver can result through improper adjustment of controls. Installation instructions have been intentionally omitted here because it is recommended that an experienced technician install the NC-183. However, in the event that an inexperienced person must, of necessity, install the Receiver, adhering to the instructions given in Section 2-3 of this Instruction Manual will enable him to do so.

The illustration on this page, identifying and locating Receiver controls, shows the operating procedure to follow in the proper sequence. This same procedure follows with a brief explanation of what each control does. The reader should refer to Section 3 of the Instruction Manual if more detailed and technical information is desired. To tune the Broadcast and Short Wave bands the operating instructions are as follows:

1. Set the SEND-RECEIVE switch at RECEIVE. The SEND position of this switch silences the Receiver for a period of time after which immediate resumption of reception may be had by setting the switch at RECEIVE.

2. Set the A.V.C.-M.V.C. switch at A.V.C. Automatic Volume Control is provided when this switch is in the A.V.C. position to compensate for fluctuating volume due to fading.

3. Set the RADIO-PHONO switch at RADIO. The PHONO position of this switch is used when a record player or similar device is connected to the Phono Input jack at the rear of the Receiver.

4. Turn A.F. GAIN control to 5. Adjustment of the audio volume is made with this control from a minimum at 0 to a maximum at 10. The setting given here is for average volume and should be adjusted to suit the listener.

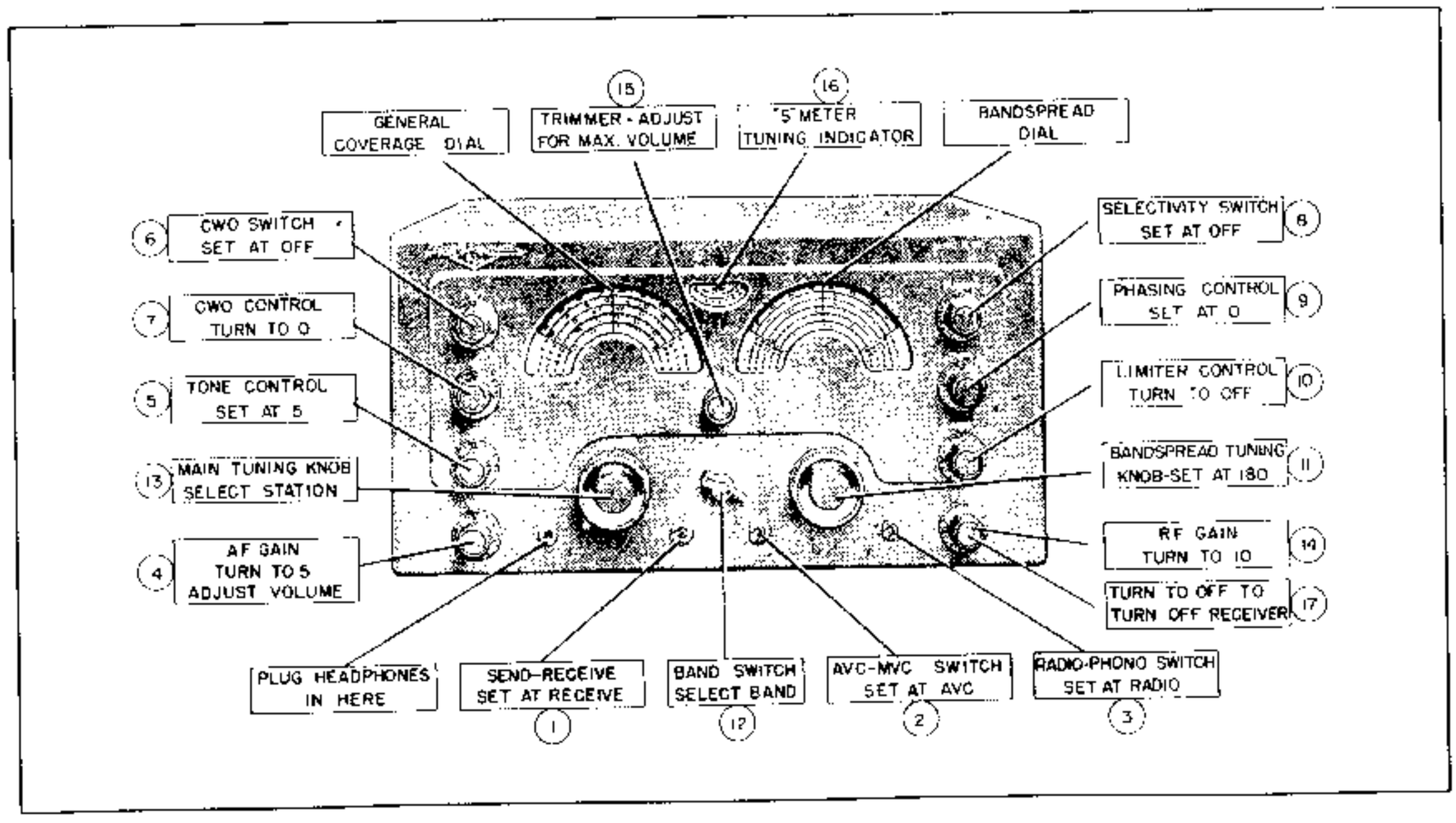
5. Set the TONE control at 5. A variable selection of tonal output from a bass tone at 0 to a tone at 10 in which the highs are predominant is provided by this control. The setting recommended here will give a normal tonal output but may be changed for different types of programs.

6. Set the C.W.O. switch at OFF. This switch is used only for the reception of code signals.

7. Turn the C.W.O. control to 0. This control is used only for the reception of code signals and does not effect receiver performance with the C.W.O. switch at OFF.

8. Set the SELECTIVITY switch at OFF. This switch is generally used only when interference by other stations is encountered. Its operation is somewhat complex and is not recommended for the inexperienced operator. See Section 3 for detailed instructions.

9. Turn the PHASING control to 0. The PHASING control is used in conjunction with the



SELECTIVITY switch.

10. Turn the LIMITER control to OFF. Reduction of interference caused by static, automobile ignition, etc., can be effected by turning on the LIMITER. Its action is increasingly effective as the control is turned towards 10.

11. Turn the BANDSPREAD tuning dial knob to the set mark at 180 on the linear scale of the BANDSPREAD dial. The BANDSPREAD dial knob and scale should be kept at the above setting when the MAIN TUNING dial knob and scale are used. However, the BANDSPREAD dial may be rotated to either side of the set mark if fine tuning is preferred for Short Wave or Amateur bands.

-NOTE-

The operator is now ready to adjust the tuning controls to select the desired station. Let us, for example, suppose that the desired station is one on the Broadcast band at 1,000 kilocycles.

12. Set the BAND SWITCH at E. The BAND SWITCH selects the band of frequencies to be tuned and is marked with designating letters which correspond to the markings at the edges and throughout the dial scales.

13. Turn the MAIN TUNING dial knob to set the pointer on the GENERAL COVERAGE dial at 1.0 on the E band. Stations on the GENERAL COVERAGE dial scale are selected by means of this control.

14. Turn R.F. GAIN control to 10. This is a dual-purpose control; when turned from A.C. OFF to ON the Receiver is turned on; when turned from 0 to 10 the sensitivity (ability to receive weak and distant stations) is progressively increased to a maximum at 10.

15. Adjust the TRIMMER control for maximum volume. After a station has been tuned in, adjust this control for best reception.

16. S-METER. Maximum deflection of the meter pointer indicates the dial and TRIMMER control setting for optimum tuning.

17. Shutting off the Receiver. To shut off the Receiver, turn the R.F. GAIN control to OFF. This is the only adjustment which completely shuts off the Receiver and the only one which need be made.

2. *Frequency Coverage*

The GENERAL COVERAGE dial has five scales; four of which are calibrated directly in megacycles and the other has a linear scale numbered 0 to 200. All markings of the Standard Broadcast Band, E, are bright red for clear identification. The other three scales have red letters throughout their range for band identification plus heavy black underlines locating short-wave features marked F, A, and P indicating Foreign, Amateur and Police bands, respectively. The BAND SWITCH positions are also marked with band letter designations to correspond to the markings at the edges and throughout the dial scales. Newspapers and other publications sometimes give the frequency of stations in kilocycles, and as the dial scales of the NC-183 are calibrated in megacycles conversion from kilocycles to megacycles will facilitate location of the station on the Receiver dial. This is done by pointing off three places to the left of the decimal point on the kilocycle figure, i.e., 1,000. kilocycles becomes 1.0 megacycles.

The following table lists each band by its designating letter and the frequency coverage of that band. The frequencies are listed in both megacycles and kilocycles. Also listed are the frequencies of short-wave features to be found on the various bands.

BAND	FREQUENCY COVERAGE		POLICE	INT. B'DCAST	AMATEUR
	Megacycles	Kilocycles	Megacycles	Megacycles	Megacycles
B	12.0 - 31.0	12,000 - 31,000		15.1 - 15.3 17.7 - 17.9 21.5 - 21.7	14.0 - 14.4 21.0 - 21.5 27.160 - 27.430 28.0 - 29.7
C	4.3 - 12.0	4,300 - 12,000		6.0 - 6.2 9.5 - 9.7 11.7 - 11.9	7.0 - 7.3
D	1.6 - 4.3	1,600 - 4,300	1.6 - 1.8 2.25 - 2.5 2.7 - 2.85		3.5 - 4.0
E	0.54- 1.6	540 - 1,600			

THE NC-183 RADIO RECEIVER

SECTION 1. DESCRIPTION

1-1. *General*

The new NC-183 is a deluxe Radio Receiver featuring performance and versatility "plus". Two R.F. stages give the NC-183 that extra measure of sensitivity and image rejection so often needed to insure uninterrupted reception. A double-diode noise limiter, effective on both phone and code reception, minimizes interference caused by external noise pulses. The selectivity characteristic of the NC-183 is adjustable over a wide range from broadband broadcast requirements to sharp amateur single-signal reception. Voltage regulated high-frequency and beat frequency oscillator circuits assures a minimum of frequency drift for both phone and code reception. Other highlights are an accessory connector socket, a push-pull audio output stage and an S-Meter, with a semi-permanent sensitivity adjustment, for signal strength readings of both phone and code signals.

The NC-183 provides reception of phone and code signals over its entire frequency range of 540 kcs. to 31 mcs. and 48 to 56 mcs. Calibrated bandspread tuning is furnished for the main amateur bands i.e., 6, 10-11, 20, 40 and 80 meters. Separate directly-calibrated dial scales with associated controls are used for general coverage and bandspread tuning.

1-2. *Circuit*

The NC-183 utilizes 14 tubes, plus a voltage regulator and rectifier, in a superhetrodyne circuit featuring circuit refinements such as two R.F. amplifier stages, a separate A.V.C. amplifier, a double-diode noise limiter and a push-pull audio output stage.

The circuit employed on all bands consists of two stages of radio frequency amplification, a first detector and separate stabilized high frequency oscillator, two intermediate frequency amplifier stages, a diode type second detector, an audio limiter, a high gain audio stage, a phase inverter and a push-pull audio output stage. The remainder of the Receiver includes automatic volume control, beat frequency oscillator, voltage regulator and rectifier circuits. The crystal filter is connected between the first detector and first I.F. stages.

1-3. *Tube Complement*

The NC-183 is supplied complete with tubes which are tested in the Peceiver at the time of alignment.

The tubes employed are as follows:

First R.F. Amplifier	6SG7
Second R.F. Amplifier	6SG7
First Detector	6SA7
H.F. Oscillator	6J5
First I.F. Amplifier	6SG7
Second I.F. Amplifier	6SG7
Second Detector-A.V.C. Detector	6h6
A.V.C. Amplifier	6AC7
Beat Frequency Oscillator	6SJ7
Noise Limiter	6H6
First Audio	6SJ7
Phase Inverter	6J5
Audio Output (2)	6V6GT/G
Voltage Regulator	OD3/VR-150
Rectifier	5U4G

1-4. *Tuning System*

The main tuning capacitor C-3 and the bandspread tuning capacitor C-4 are connected in parallel on all bands. Separate knobs with associated dial scales are used to operate these two capacitors to tune the frequency range of the Receiver in five bands as follows:

BAND	GENERAL COVERAGE	BANDSPREAD
A		48 - 56 Mc.
B	12 - 31 Mc.	27 - 30 Mc.
		14.0- 14.4 Mc.
C	4.3 - 12 Mc.	7.0- 7.3 Mc.
D	1.6 - 4.3 Mc.	3.5- 4.0 Mc.
E	0.54 - 1.6 Mc.	

As will be noted from the above table calibrated bandspread tuning is provided for the 6, 10-11, 20, 40 and 80 meter ama-

teur bands. This tuning system is extremely flexible, in that bandspread tuning may be employed to tune any portion of any band in the 540 kcs. to 31 mc. range.

Band changing is accomplished by means of a highly efficient bandswitch.

Tuning of the first R.F. stage on all bands can be readily adjusted to compensate for a wide range of antenna loading conditions by means of the front panel mounted antenna compensating capacitor.

1-5. *Noise Limiter*

A new concept in noise limiter design is employed in the NC-183 Receiver. This new limiter could be termed "double action plus" and the noise limiting action is equally effective whether receiving phone or code signals (C.W. oscillator On or Off). A threshold control on the front panel permits adjustments of the level at which limiting action starts.

1-6. *Crystal Filter*

The selectivity characteristic of the NC-183 is made adjustable by means of a crystal filter. This crystal filter is newly designed and incorporates features which make it highly flexible in its adjustments and superior in performance. The crystal filter provides uniform selectivity variation from the broad off position to the sharp number 5 position as well as phasing action for the attenuation of interfering signals.

1-7. *Signal Strength Meter*

An S-Meter for signal strength readings is associated with the A.V.C. circuit. The S-Meter scale is calibrated in S units from 1 to 9 with approximately 5 db per S unit and in db above S9 from 0 to 40 db. An adjustment is provided to enable the operator to change the above calibration if he so desires. For the purpose of comparing strong signals, which cause the S-Meter to read off-scale, with other weaker signals the sensitivity of the S-Meter may be lowered by retarding the R.F. GAIN control. The "no signal" S-Meter reading does not require adjustment.

1-8. *Accessory Connector Socket*

A standard octal socket is mounted on the receiver chassis wired in a manner to permit connection of various accessories such as a narrow-band F.M. adaptor, crystal calibrator, etc. The drawing of the Accessory Connector Socket on the Schematic Diagram shows the various connections made to the pins of this socket and the voltages available. It will be noted that B+ and filament voltages are made available at this socket.

1-9. *Tone Control*

The tonal output of the NC-183 Receiver may be varied to suit the listener by means of the TONE Control. This control is helpful when receiving weak signals through interference.

1-10. *Antenna Input*

Antenna input terminals are provided at the rear of the Receiver. The input circuit is suitable for use with a single wire antenna, a balanced feed line or a low impedance (70 ohm) concentric transmission line. The average input circuit impedance is approximately 300 ohms.

1-11. *Audio Output*

Two audio output circuits are provided:

(1) The audio output leads are brought to the 3 prong output socket, at the rear of the Receiver, having both 8 and 500 ohm terminals and a common ground terminal. The loud-speaker furnished with the NC-183 is fitted with a cable and plug to connect to the 8 ohm terminal on the output socket, the 500 ohm terminal being available for connection to a 500 ohm line. Approximately 8 watts of undistorted audio output power is available at the output socket while the maximum power is 11 watts.

(2) A headphone jack is front-panel mounted and is wired so as to silence the loud-speaker on the insertion of a phone plug. The headphone load impedance is not critical allowing a wide range of headphone types to be used. If greater audio output is desired the headphone jack connection at terminal No. 2 on the audio output transformer (the 8 ohm tap) may be connected to terminal No. 3 (the 500 ohm tap).

1-12. *Phono Input Jack*

A phono input jack is mounted at the rear of the Receiver and can be used to

connect auxiliary apparatus, such as a record player, to the audio system of the Receiver. This input circuit is high impedance and feeds into the 6SJ7 first audio amplifier stage.. The RADIO-PHONO switch on the front panel must be at the Phono position when the phono input jack is used. The AUDIO GAIN and TONE controls are operative with this connection.

Most record players are terminated in a single shielded wire. The phono input jack on the NC-183 is the type that accomodates a phono tip plug and if the record player to be used is not fitted with such a plug one can be easily attached. If the output circuit of the record player is low impedance (less than 100,000 ohms) better results will be obtained if a suitable resistor, with a value as specified for the particular record player, is connected across the phono tip plug to properly load the record player output circuit.

1-13. *Power Supply*

The NC-183 Receiver is designed for operation from a 110/120 volt or 220/240 volt 50/60 cycle power source. The Receiver is shipped from the factory with the power transformer wired for 110/120 volt operation only. A few simple wiring changes in the dual primary circuit of the power transformer are necessary to change the NC-183 for 220/240 volt operation. These changes are made directly on the power transformer terminal lugs and are as follows:

(a) Remove the jumper between terminals 4 and 6 and between 5 and 7.

(b) Connect a jumper between terminals 5 and 6. A drawing of both possible primary circuits is shown on the Schematic Diagram.

Normal power consumption is approximately 125 watts. The built-in power unit supplies all voltages required by the heater and B supply circuits--130 milliamperes at 280 volts and 5.1 amperes at 6.3 volts, respectively. A 2 ampere fuse is connected in one side of the A.C. input line to protect the receiver circuits against any voltage surges in the power line or short circuits in the Receiver. This fuse is mounted in an extractor post at the rear of the Receiver and is easily removed for examination or replacement.

1-14. *Loud-Speaker*

The loud-speaker supplied with the NC-183 is a 10 inch permanent magnet field type and is mounted in a cabinet finished to match the Receiver. The loud-speaker impedance is 8 ohms and the attached plug connects to the 8 ohm Receiver output circuit.

SECTION 2. INSTALLATION

2-1. *Arrangement*

The Receiver and loud-speaker may be arranged in any desired position although it is not recommended that the loud-speaker be placed on top of the Receiver as undesirable "microphonics" may result.

2-2. *Antenna Recommendations*

The antenna input circuit of the Receiver is arranged for operation from either a single-wire antenna, a doublet antenna or other types having impedances of 70 ohms or more. The antenna terminal strip, at the rear of the Receiver, has three terminals, two are for antenna connections and the other for a ground. The ground terminal has connected to it a metal link which is used to ground one antenna lead as necessary. With balanced antenna systems, such as the doublet type, the metal link is not used. With an unbalanced system, such as the single-wire antenna, it is desirable to ground the unused antenna terminal by means of the metal link. For an unbalanced system of the concentric transmission line type, it is recommended that the outside of the concentric line be grounded directly to the ground lug below the antenna terminal strip. The external ground connection to the ground lug below the antenna terminal strip should be maintained at all times.

The most practical antenna for use in installations where the Receiver is to be used over a wide range of frequencies is the single wire type. An antenna length of from 50 to 100 feet is recommended. The

antenna lead-in should be connected to one antenna terminal and the metal link used to ground the other terminal.

For best impedance matching to the antenna input circuit, an antenna with a 70 to 300 ohm transmission line is recommended. If a doublet type with a 70 to 300 ohm balanced transmission line is used the metal grounding link should not be used. For optimum results the antenna should be cut to the proper length corresponding to the desired operating frequency. See Fig. No. 1. It must be remembered that an antenna installation of this type will have maximum efficiency over a narrow band of frequencies near the frequency for which the antenna was designed and will be most useful in installations where the Receiver is tuned to one frequency or narrow band of frequencies. For other frequencies it would be desirable to connect the two transmission line leads together at one antenna terminal and the metal link used to ground the other terminal. The antenna is thus utilized as a single wire type.

In an installation where the Receiver is to be used as the receiving unit in a transmitting station, the most efficient operation will usually result from use of the transmitting antenna as a receiving antenna also. This is especially true if the transmitting antenna is of the multi-element, directional type as the same antenna gain is available for both receiving and transmitting--a very desirable condition. For switching the antenna from transmitter to receiver, an antenna change-over relay with good high-frequency insulation is recommended. A second relay for controlling the transmitter plate supply and the Re-

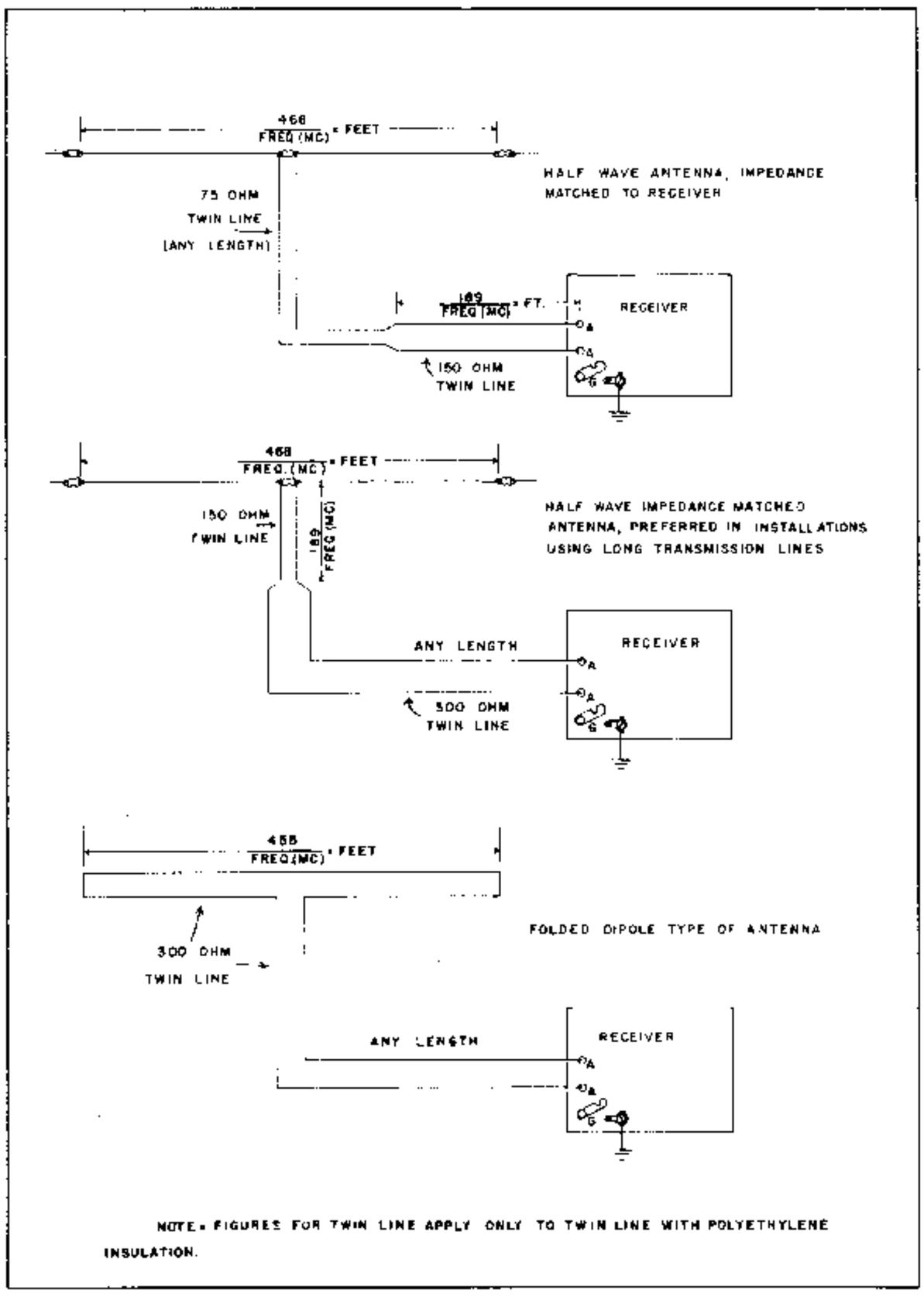


Figure No. 1. Typical Antenna Installations

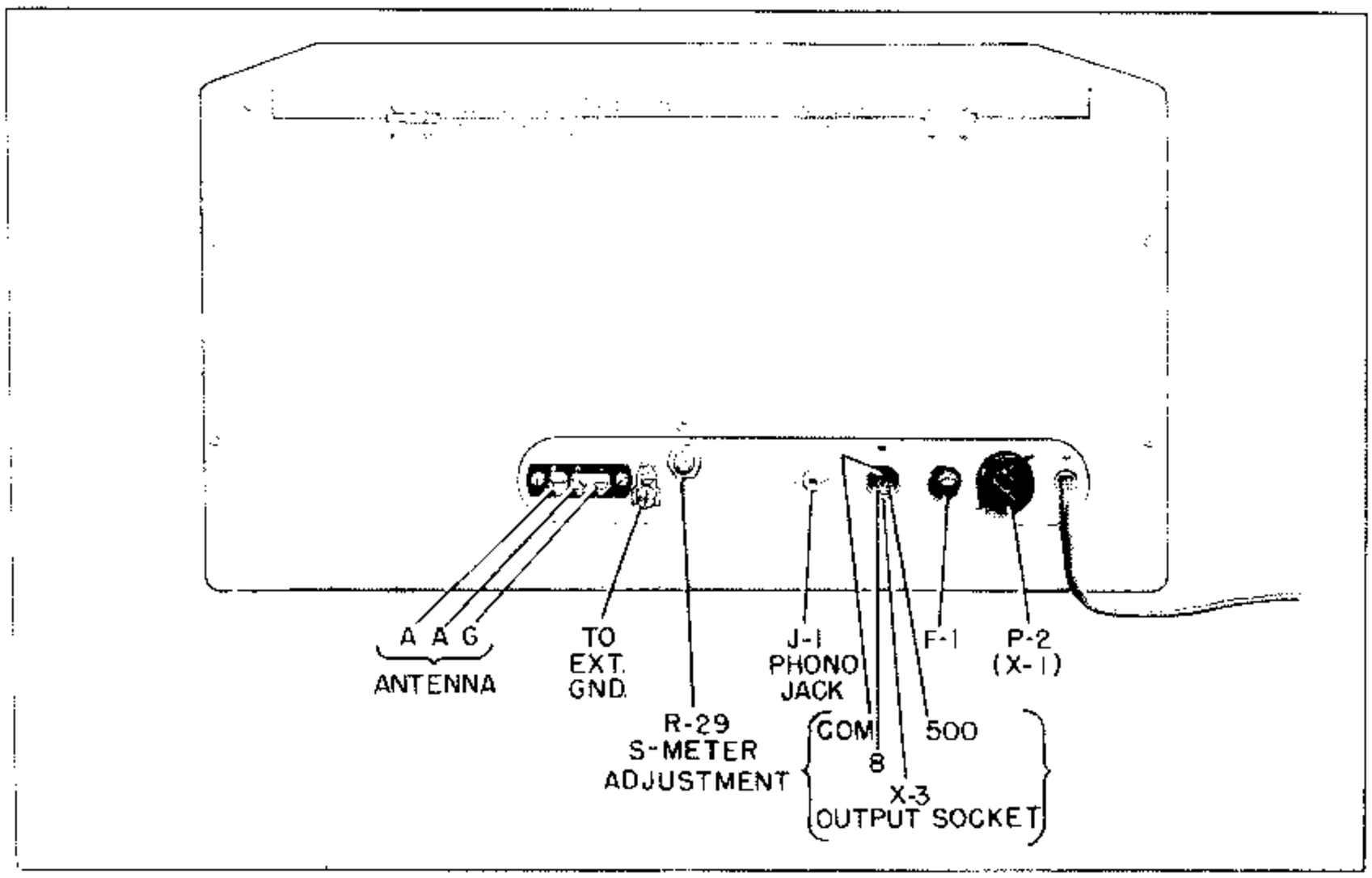


Figure No. 2. Rear View of Receiver

ceiver B+circuit may be used to achieve single-switch control of the station. This second relay should be a double pole, single throw type having one normally open pair of contacts and one normally closed pair of contacts.

2-3. *Installation Procedure*

After unpacking the Receiver and Speaker procede as follows:

(1) Seat A.C. jumper plug and all tubes firmly in their sockets.

(2) Insert the loud-speaker plug into the three pin output socket at the rear of the Receiver.

(3) Connect a good external ground to the screw-type lug located at the rear of the Receiver below the antenna terminal strip.

(4) Connect the antenna as recommended in paragraph 2-2.

(5) Connect the power cord to a 115 volt, 50/60 cycle AC source of supply.

(6) Set controls as recommended in Section 3 for reception of signals.

-NOTE-

Where the Receiver is located in the field of a relatively powerful transmitter, it is advisable to provide some means of preventing damage to the Receiver antenna coil. If a separate receiving antenna is used, a means for disconnecting or grounding the antenna during transmission periods should be provided.

2-4. *Battery Operation*

The NC-183 may be operated in portable or emergency service by connecting batteries to the terminals of the power socket located at the rear of the Receiver. An octal plug, similar to the A.C. jumper plug, may be wired and used for interconnection between batteries and Receiver. The battery plug used must be wired in accordance with the drawing shown on the Schematic Diagram. A 6 volt heater supply (storage battery) should be connected to terminals 3 and 5 and 135 to 250 volt "B" supply connected to terminals 4 and 8. The recommended "B" voltage supply for battery economy is between 135 and 180 volts. At voltages between 135 and 150 the voltage regulator tube will not ignite affecting a further battery economy. For stand-by operation in all cases it is recommended that a switch be placed in the battery B+ lead for increased battery economy as the "B" switch on the Receiver does not open the B supply circuit to the H.F. oscillator, voltage regulator, and push-pull audio output tubes. A suggested refinement is to include a switch in the A+ lead so that the tube heaters may be turned off when the Receiver is not in use without the necessity of removing the battery plug from the battery socket.

SECTION 3. OPERATION

3-1. *Controls*

All controls are identified by front panel markings for ease of identification. The controls are located in a symmetrical manner and are arranged for ease of operation.

The five positions of the BAND SWITCH are marked with identifying band letters plus numerical identification of the Amateur bands covered on the BANDSPREAD dial scale. These identifying markers correspond to the markers on the dial scale escutcheons. The BAND SWITCH does not have any limit stops so that band changing may be accomplished with a minimum of BAND SWITCH turning.

The GENERAL COVERAGE dial knob operates the main tuning capacitor and turns the main dial scale through a combination pinch drive and anti-backlash gear train. The main dial has five scales; four of which are calibrated directly in frequency, the other having a 0-200 linear scale for auxiliary logging purposes. The main dial escutcheon is marked with frequency limits in megacycles and band letter designations identifying each scale on the dial.

The BANDSPREAD tuning dial knob operates the bandspread tuning capacitor and turns the bandspread dial scale through a combination pinch drive and anti-backlash gear train which is similar to that used for general coverage tuning. The bandspread dial has six scales; five of which are calibrated in frequency for the 6, 10-11, 20, 40 and 80 meter Amateur bands, the other having a 0-200 linear scale for bandspread logging on other than the frequency calibrated bandspread frequencies. The bandspread dial escutcheon is marked with identifying band letters and amateur band designation for each scale.

The TRIMMER control operates a tuning capacitor which is connected across the first R.F. amplifier section of the main tuning capacitor. The TRIMMER control is used to tune the first R.F. amplifier stage properly under a wide variety of antenna loading conditions.

The R.F. GAIN control adjusts the amplification of the R.F. and I.F. amplifier stages. Clockwise rotation of the control (towards 10) increases Receiver gain. The A.C. POWER switch is associated with the R.F. GAIN control and A.C. power is turned ON as the R.F. GAIN control is advanced from A.C. OFF to 0 on the scale.

The A.F. GAIN control adjusts the

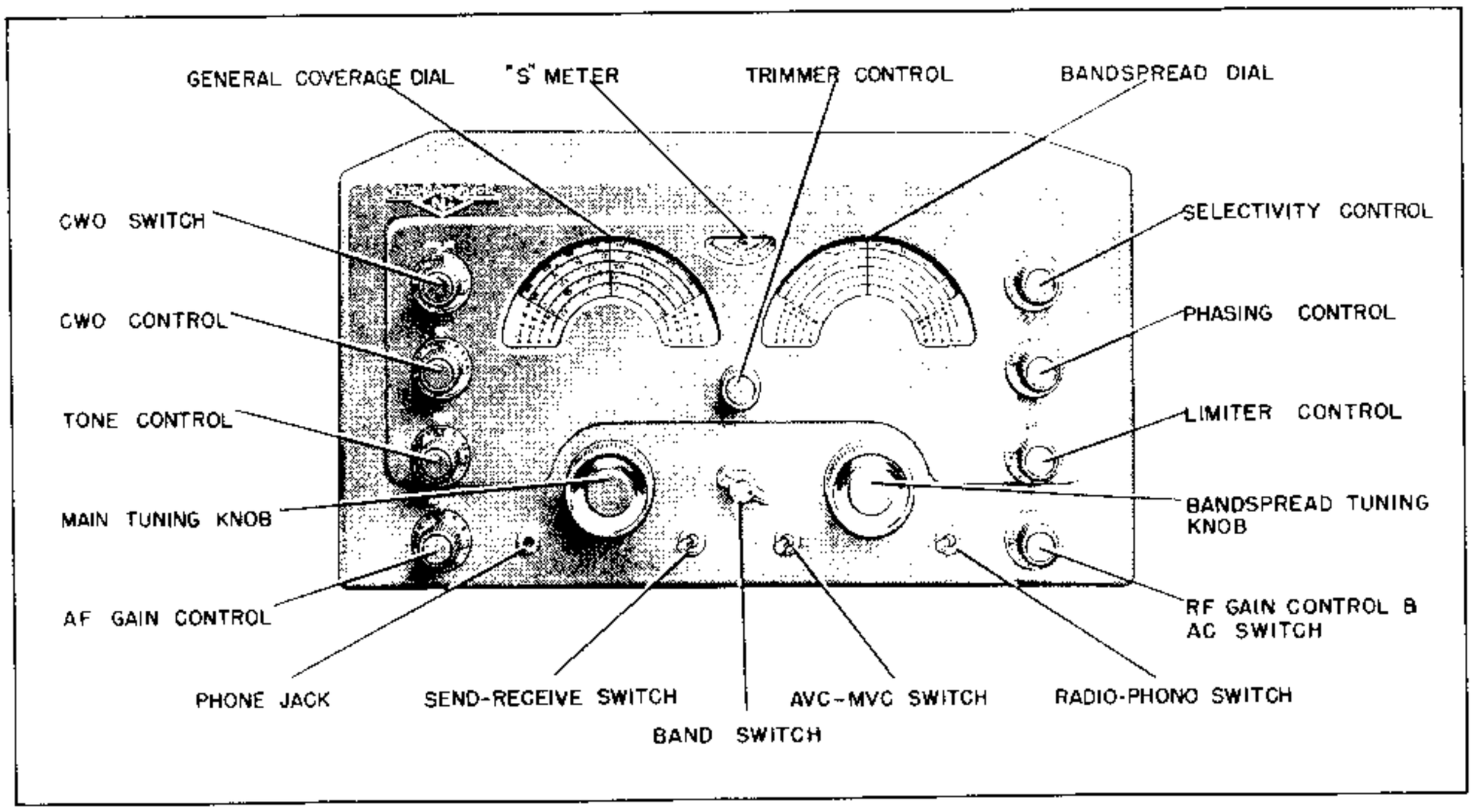


Figure No. 3. Front View of Receiver

amount of audio voltage applied to the first audio tube. Clockwise rotation of the control (towards 10) increases the audio output power of the Receiver. The A.F. GAIN control is operative when an audio signal is applied to the PHONO input jack.

The LIMITER control is used to switch the limiter into the circuit and also to adjust the threshold at which limiting action starts. The limiter is turned ON as the LIMITER control is advanced from OFF to 0 and the threshold is lowered as the control is advanced towards 10. Any noise peak voltages in excess of this adjustable threshold are prevented from reaching the audio amplifier. The limiter circuit is the double-diode type and is equally effective for both phone or code reception.

The TONE control is used to vary the frequency characteristic of the audio output of the Receiver. Turning this control towards 0 on its scale increasingly attenuates the higher frequencies.

The C.W.O. SWITCH and C.W.O. control are only used for the reception of radiotelegraph code signals. The C.W.O. SWITCH is used to turn the C.W. oscillator ON and the C.W.O. control is used to adjust the pitch of the C.W. note. At zero on the C.W.O. scale the C.W. oscillator is tuned to the intermediate frequency of the Receiver.

The PHASING and SELECTIVITY controls adjust the operation of the crystal filter. Receiver selectivity is made progressively sharper as the SELECTIVITY control is turned from OFF towards 5 on its scale. The PHASING control is inoperative with the SELECTIVITY control in the OFF position. The PHASING control is used to attenuate interfering signals and is connected in a bridge circuit so that the bridge can be balanced to reject the undesired signal.

The SEND-RECEIVE switch is used to quiet the Receiver during transmission periods or other times when it is desirable to resume reception immediately (not having to wait for the tubes to warm up). The SEND-RECEIVE switch is connected in the B circuit. See Section 2-4 for use of this switch in battery operation. The SEND-RECEIVE switch should not be used to silence the Receiver after the completion of an operating period.

External (remote) stand-by control of the Receiver may be accomplished by connecting a switch or relay to terminals 1 and 4 of the A.C. jumper plug as shown on the Schematic Diagram. This is a parallel arrangement permitting the SEND-RECEIVE switch to remain operative with the external switch or relay in the circuit.

The A.V.C.-M.V.C. switch is used to adjust the Receiver for either Automatic Volume Control or Manual Volume Control operation. Automatic Volume Control can be used for either phone or code reception. The A.V.C. time constants have been adjusted so that receiver gain does not change appreciably during average code speed reception.

The RADIO-PHONO switch is set at the Phono position when it is desired to use the audio system of the NC-183 in the event a record player or similar apparatus is connected to the Phono Input jack. In the Phono position all receiver circuits but the audio are rendered inoperative; the AUDIO GAIN and TONE controls remain operative. If it is so desired the record player may remain connected to the Receiver and normal receiver operation resumed by setting the RADIO-PHONO switch at Radio.

The screw-type adjustment at the rear of the Receiver is provided to allow the operator to adjust the sensitivity of the S-Meter. The S-Meter is calibrated at National laboratories so that approximately 50 microvolts equals S-9 and roughly 5,000 microvolts equals 40 db above S-9.

3-2. *Phone Reception*

After the equipment is properly installed, as outlined in Section 2, it is placed in operation for the reception of phone signals by adjusting the receiver controls as follows:

1. Set the SEND-RECEIVE at Receive.
2. Set the RADIO-PHONO switch at Radio.
3. Set the A.V.C.-M.V.C. switch at A.V.C.
4. Turn the C.W.O. switch to OFF.
5. Set the SELECTIVITY control at OFF.

6. Set the PHASING control at 0.

7. Set the LIMITER control at OFF.

8. Advance the R.F. GAIN control to a point between 8 and 10.

9. Set the A.F. GAIN control at the point providing the desired audio volume.

10. Adjust the TONE control to give the desired audio characteristic.

The Receiver is now adjusted for the reception of phone signals and will tune to the frequency indicated by the tuning dial and band switch settings. Set the TRIMMER control for maximum S-Meter reading after the desired station has been selected, or alternately in the absence of a signal the TRIMMER may be set for maximum receiver background noise.

The tuning system in the NC-183 is arranged for ease of operation and accuracy of calibration. However, it is necessary that the proper settings of the GENERAL COVERAGE and BANDSPREAD dials be observed to maintain accuracy of calibration. For all general coverage tuning the BANDSPREAD dial must be at the "Set" mark appearing at approximately 180 on the linear scale. For bandspread tuning the GENERAL COVERAGE dial must be set at the proper point corresponding to the Amateur band being tuned. The various "set points" are marked directly on the GENERAL COVERAGE dial scale and are clearly indicated by a circular marker containing the Amateur band designation. The following table lists the location of the GENERAL COVERAGE dial settings for bandspread tuning of the Amateur bands:

AMATEUR BAND	GENERAL COVERAGE DIAL SETTING
6	198 on linear scale
10-11	30.0 Mc.
20	14.4 Mc.
40	7.3 Mc.
80	4.0 Mc.

Tuning of the 6 meter band is accomplished by use of the BANDSPREAD dial only.

The BAND SWITCH setting determines the band of frequencies which the Receiver will tune at any one time.

With the A.V.C-M.V.C. switch set at the A.V.C. position, the R.F. GAIN control should be advanced as far as receiving conditions permit. However, if background noise proves objectionable, the R.F. GAIN control may be retarded to approximately 6 or 7 to reduce the level of background noise. The operator must remember that automatic volume control action will be restricted unless the R.F. GAIN control is fully advanced. Audio output should be adjusted entirely by means of the A.F. GAIN control.

The A.V.C.-M.V.C. switch may be set at the M.V.C. position to provide increased sensitivity in some cases. With such a setting the operator must be careful not to advance the R.F. GAIN control to a point where I.F. or audio amplifier overload occurs. Such overload is indicated by distortion. In general, the A.F. GAIN control may be set at a fixed position, approximately 5, and the R.F. GAIN control used to adjust the audio volume.

If a signal is weak and partically obscured by background noise and static, best signal-to-noise ratio will be obtained by turning the TONE control toward 0 on its scale. The most effective setting must be determined by trial as too much attenuation of the higher audio frequencies may not prove desirable.

When a signal is accompanied by static peaks or noise pulses of high intensity and short duration, the best signal-to-noise ratio will be obtained by turning the LIMITER control ON and advancing it as necessary. The optimum setting can only be determined by trial as too much limiter action may impair the audio quality.

The selectivity of the Receiver is adjusted by means of the crystal filter SELECTIVITY control. The normal setting of the SELECTIVITY control in phone reception is at one of the positions affording broad selectivity. Positions marked OFF, 1 or 2 are recommended. Selectivity may be progressively increased by turning the SELECTIVITY control to positions 3, 4 or 5. The evidences of increasing selectivity will be the attenuation of the higher frequency audio tones of the signal as well as sharper tuning. Increasing selectivity too much will attenuate these higher tones to such an extent that phone signals may become unintelligible.

The PHASING control is part of the crystal filter and is used to eliminate

or attenuate interfering heterodynes. The PHASING control is inoperative with the SELECTIVITY control in the OFF position but is operative at all other SELECTIVITY control settings. The normal setting of the PHASING control, with the crystal filter ON (SELECTIVITY control at 1, 2, 3, 4 or 5), in phone reception is at 0 on the scale. If, after a signal has been tuned in, an interfering signal causes a heterodyne or whistle the PHASING control should be adjusted until interference is reduced to a minimum. The setting of the PHASING control which provides maximum attenuation of the heterodyne will depend on the pitch of the heterodyne whistle. If the heterodyne is below 1,000 cycles, the optimum PHASING control setting will be near one end of the scale or the other, depending upon whether the interfering signal has a higher or lower frequency than the desired signal.

3-3. *C.W. Reception*

The Receiver is placed in operation for the reception of C.W. signals in the same manner as that outlined for phone reception (Section 3-2) except that the C.W.O. switch should be set at ON and the C.W.O. control set at mid-scale. The C.W. code characters are made audible by the heterodyning action of the C.W. oscillator with the incoming signal. The frequency of the C.W. oscillator can be varied by rotation of the C.W.O. control.

The sensitivity of the Receiver should be adjusted by means of the R.F. GAIN control and the audio volume by means of the A.F. GAIN control. When receiving C.W. characters with slow keying or long pauses during keying it may be desirable to set the A.V.C.-M.V.C. switch at M.V.C. so that the receiver gain does not change during keying pauses. In this case, the A.F. GAIN control should be set at a fixed position, approximately 5, and the audio volume adjusted by means of the R.F. GAIN control. In either of the above cases care should be taken not to advance the R.F. GAIN control to a point where I.F. or audio amplifier overload occurs.

The action of the TONE and LIMITER controls will be similar to that described in Section 3-2. However, in C.W. reception it will be possible to advance these controls considerably further than is desirable in phone reception since any impairing of audio quality is relatively unimportant.

Turning the C.W.O. control to either side of zero will change the characteristic pitch of the receiver background noise thus providing a means of adjusting the audio beat note to the operator's preference. The pitch will become higher as the C.W.O. oscillator is detuned from the I.F. amplifier.

Crystal filter operation for C.W. reception is similar to that described for phone reception (Section 3-2) with the exception that it is possible to utilize maximum selectivity without the loss of audio quality experienced in phone reception. When maximum selectivity is employed, i.e., SELECTIVITY control at 5, tuning is very critical and care must be taken to assure proper tuning. When tuning across the carrier of a received signal the audio beat note is very sharply peaked at a definite audio frequency. The maximum response indicates the proper dial setting. The pitch of the beat note peak may be adjusted by use of the C.W.O. control to provide an audio tone pleasing to copy. With the Receiver tuned to "crystal peak" an interfering signal may be attenuated by proper setting of the PHASING control since this control does not appreciably affect the desired signal.

A distinct advantage in the reception of weak C.W. signals through interference can be realized by use of the "single-signal" properties of the NC-183 Receiver. The C.W. oscillator should be detuned until the pitch of the receiver background noise is roughly 2,000 cycles. Under this condition the audio beat note of any C.W. code signal will show a broad peak in output at approximately 2,000 cycles. This peak is easily found by rotating the tuning dial slowly through the carrier of a received signal. This peak will appear on one side of "zero beat" only and on the other side of "zero beat" the 2,000 cycle note will be considerably weaker. It should be noted that depending on the frequency of the interfering signal better receiving conditions will be obtained by detuning the C.W.O. on one side of zero rather than on the other. The best setting of the C.W.O. con-

trol can only be determined by trial settings on either side of zero until optimum results are obtained.

3-4. *Measurement of Signal Strength*

The S-Meter in the NC-183 Receiver furnishes a means for the measurement of signal strength of incoming phone or code signals. To utilize the S-Meter the following control settings must be observed: R.F. GAIN at 10, A.V.C.-M.V.C. at A.V.C. and SELECTIVITY at OFF. The TRIMMER control should be adjusted for maximum S-Meter reading after a signal has been tuned in. All other control settings will not affect the S-Meter readings.

In instances where a strong signal causes the S-Meter to read off-scale the S-Meter sensitivity may be lowered by retarding the R.F. GAIN control until an on-scale reading is obtained. Without disturbing the setting of the R.F. GAIN control the comparative strength of this strong signal may be compared with other signals.

The sensitivity of the S-Meter is adjusted as outlined in Section 1-7, to meet average operating conditions. The S-Meter sensitivity adjustment at the rear of the Receiver enables the operator to change the sensitivity to meet the needs of his own particular installation.

SECTION 4. SERVICE AND TEST DATA

4-1. *Tube Failures*

The partial or complete failure of a vacuum tube in the Receiver may reduce the sensitivity, produce intermittent operation, or cause the equipment to be completely inoperative. If tube failure is suspected all tubes should be checked in suitable tube testing equipment, or by replacement with tubes of proven quality. Care should be taken that any tubes removed for checking purposes be returned to their original sockets thereby reducing the necessity for realignment.

Tubes of the same type will vary slightly in their individual characteristics and this fact should be borne in mind when replacements become necessary. The high frequency oscillator and I.F. tubes should be chosen with care to select a replacement which most nearly approaches the characteristics of the original tube. A replacement high frequency oscillator tube can be readily checked by noting any change in dial calibration, particularly in the amateur bandspread bands. Substitution of new I.F. amplifier tubes may possibly alter overall gain and selectivity characteristics. Instructions for realignment are given in detail in Section 6-2.

4-2. *Circuit Failures*

All components parts in the NC-183 Receiver have been carefully selected to assure an ample factor of safety. Failure may occur in individual cases and the most common, excluding tubes, will probably be due to breakdown of a capacitor or resistor. Measurement of voltages in accordance with Section 4-4 will most likely indicate where failure has occurred. A bypass capacitor which has failed may cause overload of associated resistors. These resistors should be checked for any change in resistance value. An overloaded or shorted resistor will sometimes be evidenced by scorching or discoloration on the surface of the resistor. An open capacitor, often the cause of oscillation or loss of sensitivity, may be checked by temporarily connecting a good capacitor across it. Intermittently poor connections can usually be located by lightly tapping each part with a piece of insulating material.

4-3. *Stage Gain Measurements*

The sensitivity measurements listed below are made with the Receiver set up as specified in Section 3-2 except that the A.V.C.-M.V.C. switch must be set at M.V.C. and the A.F. GAIN control at 10. An output meter with an impedance to match the Receiver output circuit (8 or 500 ohms) should be connected to the output socket in place of the loud-speaker. A three-prong plug, similar to the loud-speaker plug, can be wired for connection of the output meter to the Receiver. It is important that the

proper output impedance matching be observed, i.e., 8 or 500 ohms depending upon which terminals of the output socket are used.

The high output lead of a signal generator should be connected through a 0.001 capacitor to the pin of the tube as specified in the following table and the ground lead connected to the receiver chassis. The signal generator should be adjusted to deliver a test signal of 455 Kc. plus or minus 2 Kc. either modulated or unmodulated.

The BAND SWITCH must be set at the mid-position between the A and E bands.

With 1 watt output at the audio output socket the test signal should be within the limits specified below:

TERMINAL	TEST SIGNAL
Mixer Grid	13± 3 Microvolts
First IF Grid	170± 30 Microvolts
Sec. Det. Grid	33,000± 6,000 Microvolts

4-4. *Voltage Tabulation*

All voltage measurements should be made using a high-impedance vacuum tube volt-meter. Readings taken with any other type of instrument will differ greatly from those shown on Figure No. 4. The control settings to be observed are shown on Figure No. 4. All voltages are measured between specified terminal and chassis.

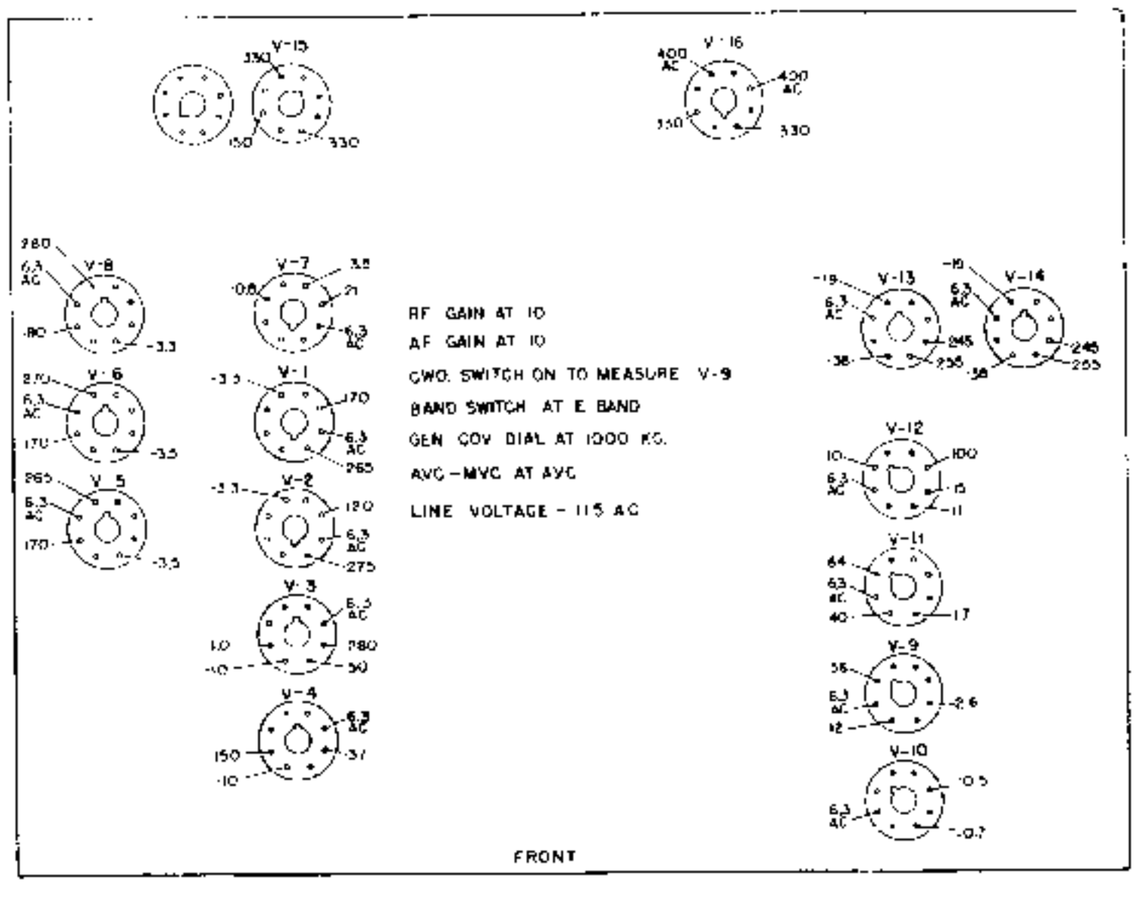


Figure No. 4. Tube Socket Voltages

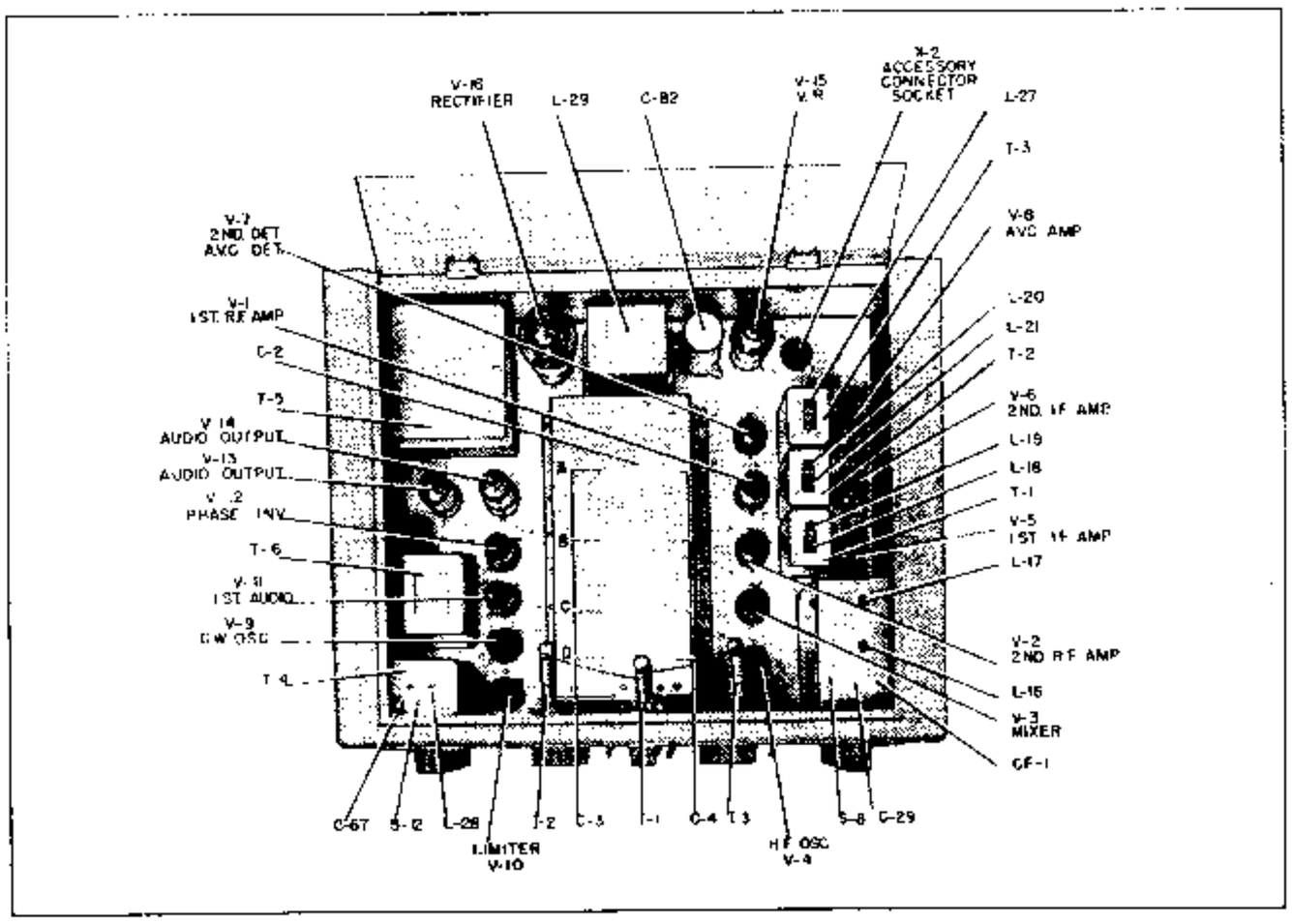


Figure No. 5. Top View of Receiver

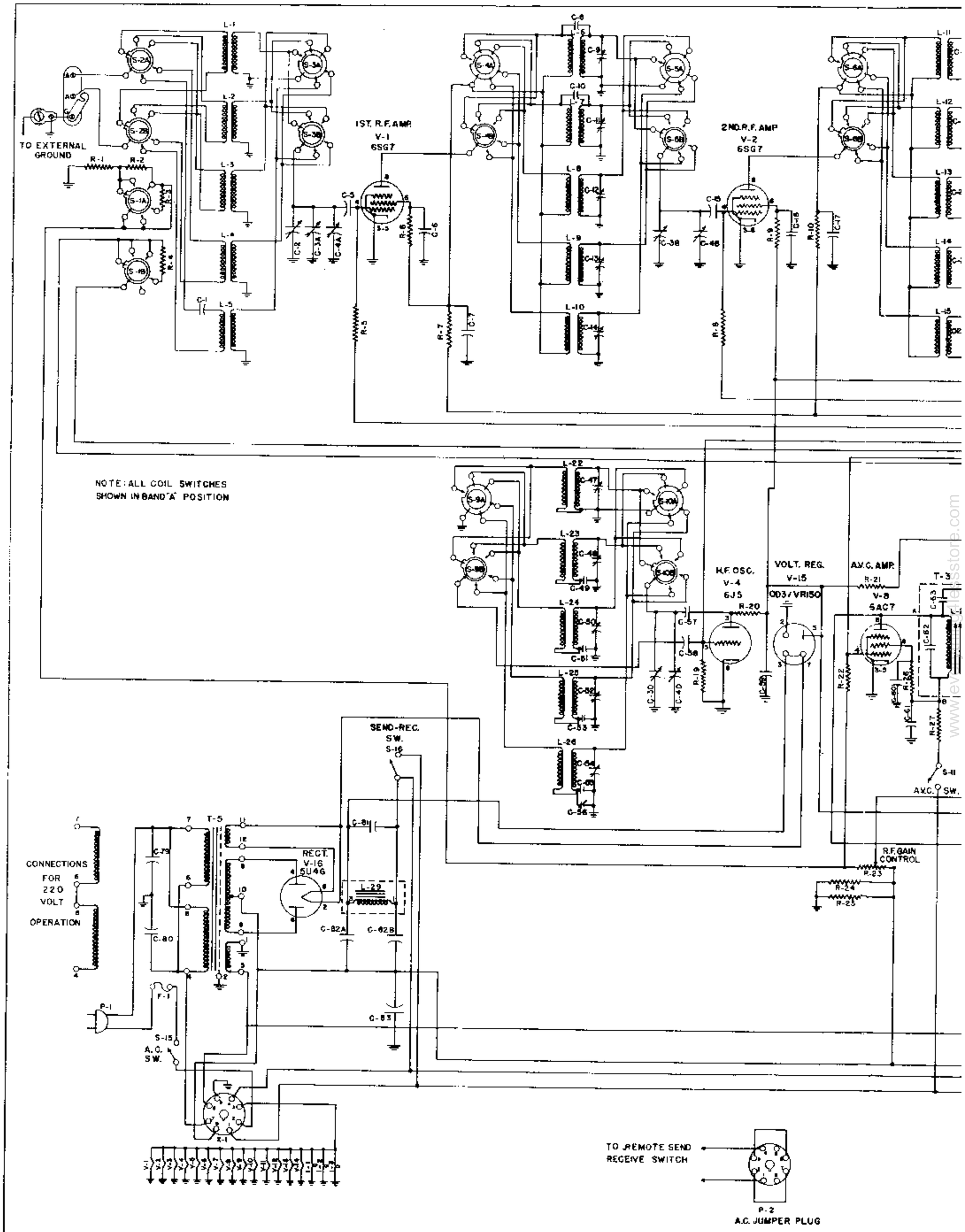
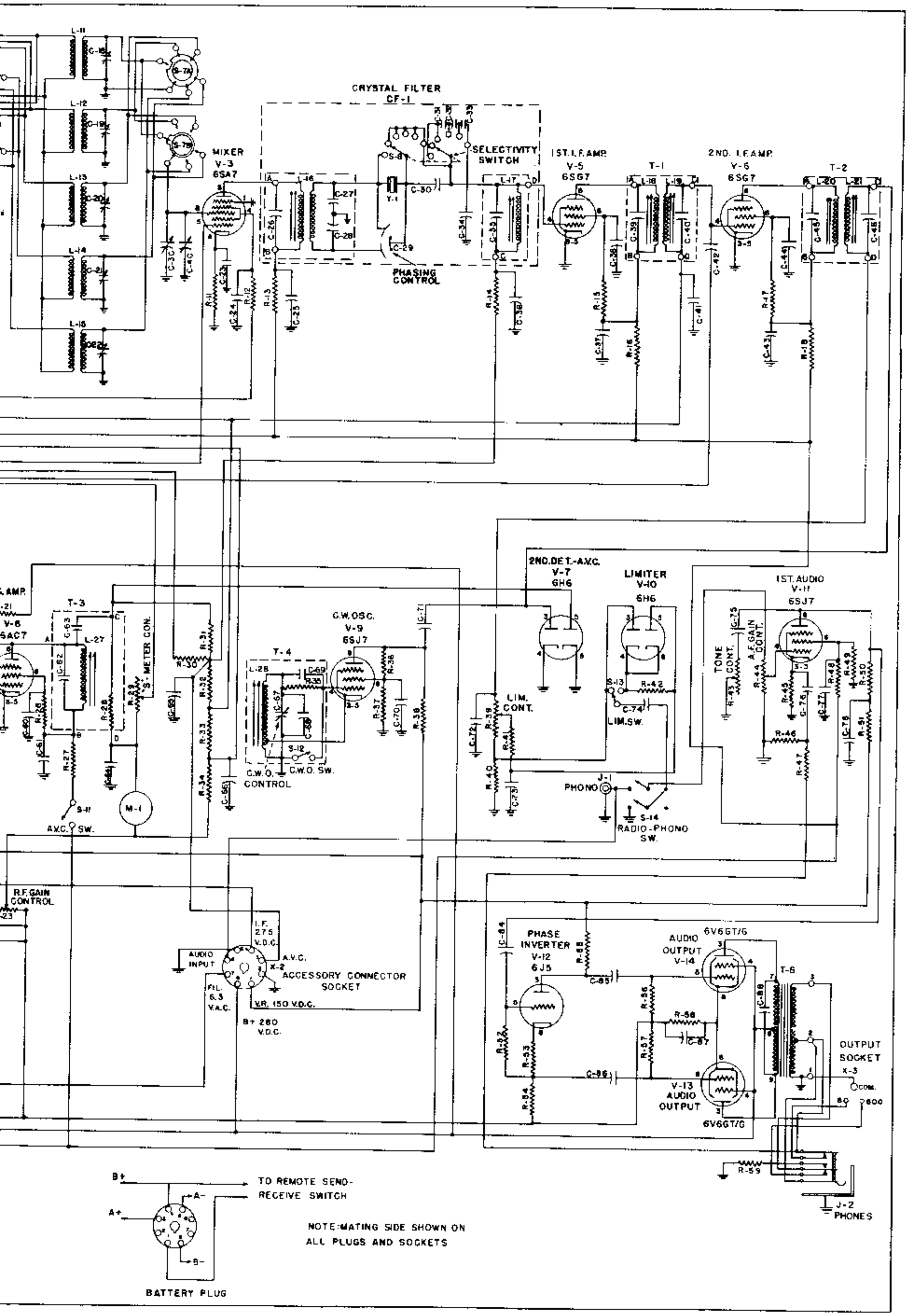


Figure No. 6. NC-183 Receiver Sch



ceiver Schematic Diagram

SECTION 5. PARTS LIST

Symbol	*Function*	*Type*	*Rating*
	CAPACITORS		
C-1	Ant. Coupling	Ceramic	250 Mmf., 500 VDCW
C-2	Trimmer Control	Air	Variable
C-3	Main Tuning	Air	Variable
C-3A	1st. R.F. Amp. Tuning	Air	Part of C-3
C-3B	2nd. R.F. Amp. Tuning	Air	Part of C-3
C-3C	1st. Det. Tuning	Air	Part of C-3
C-3D	H.F. Osc. Tuning	Air	Part of C-3
C-4	Bandspread Tuning	Air	Variable
C-4A	1st. R.F. Bandspread Tuning	Air	Part of C-4
C-4B	2nd. R.F. Bandspread Tuning	Air	Part of C-4
C-4C	1st. Det. Bandspread Tuning	Air	Part of C-4
C-4D	H.F. Osc. Bandspread Tuning	Air	Part of C-4
C-5	1st. R.F. Amp. Grid Coupling	Mica	0.001 Mfd., 300 VDCW
C-6	1st. R.F. Screen Bypass	Paper	0.01 Mfd., 600 VDCW
C-7	1st. R.F. Amp. Plate Filter	Paper	0.05 Mfd., 600 VDCW
C-8	A Band 2nd. R.F. Coupling	Ceramic	10 Mmf., 500 VDCW
C-9	A Band 2nd. R.F. Trimmer	Mica	Variable
C-10	B Band 2nd. R.F. Coupling	Ceramic	5 Mmf., 500 VDCW
C-11	B Band 2nd. R.F. Trimmer	Mica	Variable
C-12	C Band 2nd. R.F. Trimmer	Mica	Variable
C-13	D Band 2nd. R.F. Trimmer	Mica	Variable
C-14	E Band 2nd. R.F. Trimmer	Mica	Variable
C-15	2nd. R.F. Amp. Grid Coupling	Mica	0.001 Mfd., 300 VDCW
C-16	2nd. R.F. Screen Bypass	Paper	0.01 Mfd., 600 VDCW
C-17	2nd. R.F. Plate Filter	Paper	0.05 Mfd., 600 VDCW
C-18	A Band 1st. Det. Trimmer	Mica	Variable
C-19	B Band 1st. Det. Trimmer	Mica	Variable
C-20	C Band 1st. Det. Trimmer	Mica	Variable
C-21	D Band 1st. Det. Trimmer	Mica	Variable
C-22	E Band 1st. Det. Trimmer	Mica	Variable
C-23	Mixer Cathode Bypass	Paper	0.1 Mfd., 400 VDCW
C-24	Mixer Screen Bypass	Paper	0.01 Mfd., 600 VDCW
C-25	Mixer Plate Filter	Paper	0.05 Mfd., 600 VDCW
C-26	Crystal Filter Input Tuning	Mica	510 Mmf., 500 VDCW
C-27	Crystal Filter Bridge	Ceramic	85 Mmf., 500 VDCW
C-28	Crystal Filter Bridge	Ceramic	50 Mmf., 500 VDCW
C-29	Crystal Filter Phasing	Air	Variable
C-30	Crystal Filter Coupling	Ceramic	10 Mmf., 500 VDCW
C-31	Selectivity Adjusting	Ceramic	25 Mmf., 500 VDCW
C-32	Selectivity Adjusting	Ceramic	100 Mmf., 500 VDCW
C-33	Selectivity Adjusting	Ceramic	100 Mmf., 500 VDCW
C-34	Selectivity Adjusting	Ceramic	50 Mmf., 500 VDCW
C-35	Crystal Filter Output Tuning	Mica	510 Mmf., 500 VDCW

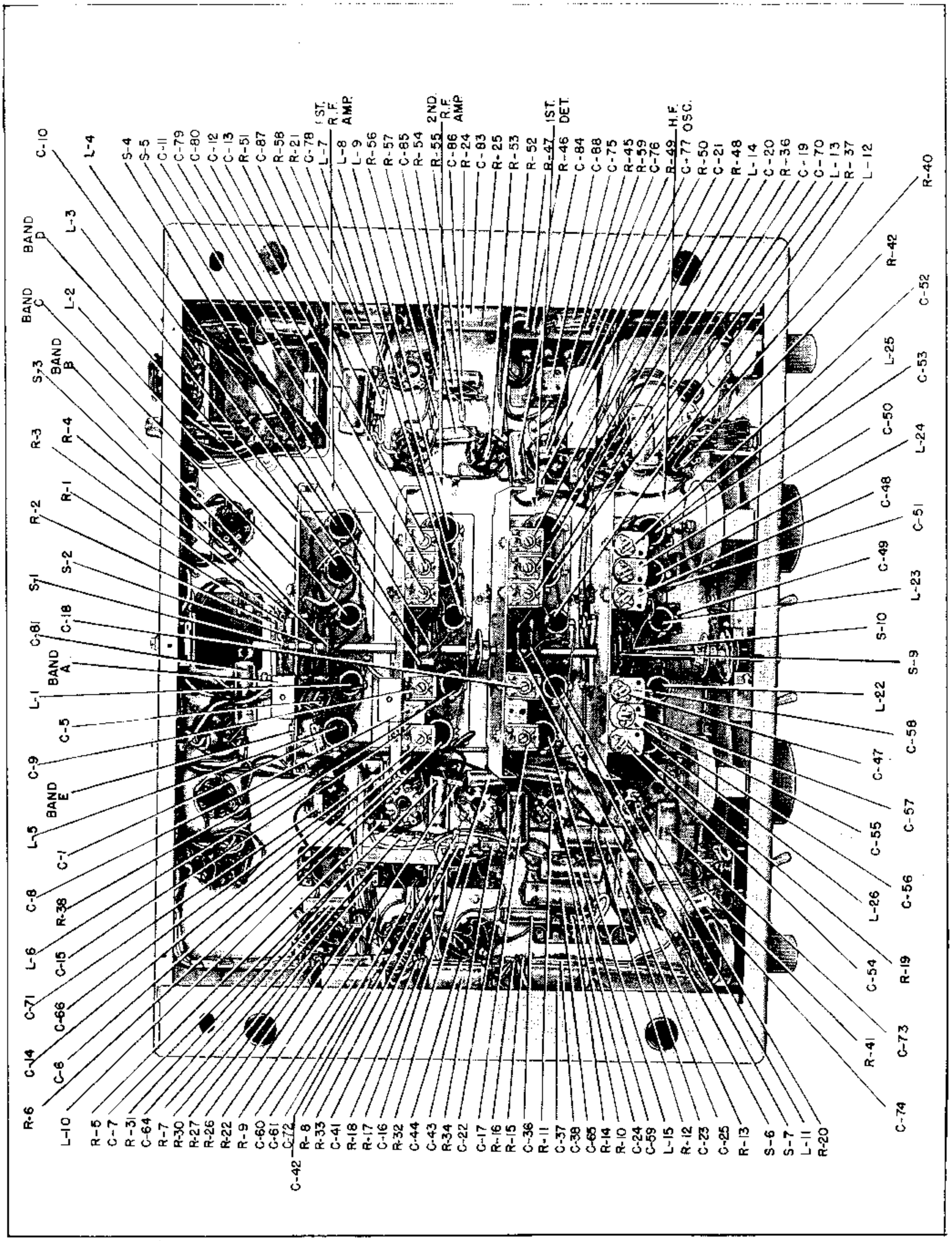


Figure No. 7. Bottom View of Receiver (Coil Compartment Side Plates Removed)

PARTS LIST (Continued)

Symbol	*Function*	*Type*	*Rating*
	CAPACITORS (Continued)		
C-36	1st. I.F. Grid Filter	Paper	0.01 Mfd., 600 VDCW
C-37	1st. I.F. Plate Filter	Paper	0.05 Mfd., 600 VDCW
C-38	1st. I.F. Screen Bypass	Paper	0.01 Mfd., 600 VDCW
C-39	T-1 Primary Tuning	Mica	510 Mmf., 500 VDCW
C-40	T-1 Secondary Tuning	Mica	510 Mmf., 500 VDCW
C-41	2nd. I.F. Grid Filter	Paper	0.01 Mfd., 600 VDCW
C-42	2nd. I.F. Grid to A.V.C. Grid Coupling	Ceramic	47 Mmf.
C-43	2nd. I.F. Plate Filter	Paper	0.05 Mfd., 600 VDCW
C-44	2nd. I.F. Screen Bypass	Paper	0.01 Mfd., 600 VDCW
C-45	T-2 Primary Tuning	Mica	510 Mmf., 500 VDCW
C-46	T-2 Secondary Tuning	Mica	510 Mmf., 500 VDCW
C-47	A Band H.F. Osc. Trimmer	Ceramic	Variable
C-48	B Band H.F. Osc. Trimmer	Ceramic	Variable
C-49	B Band H.F. Osc. Padder	Mica	.0085 Mfd., 300 VDCW
C-50	C Band H.F. Osc. Trimmer	Ceramic	Variable
C-51	C Band H.F. Osc. Padder	Mica	.0042 Mfd., 300 VDCW
C-52	D Band H.F. Osc. Trimmer	Ceramic	Variable
C-53	D Band H.F. Osc. Padder	Mica	1250 Mmf., 500 VDCW
C-54	E Band H.F. Osc. Trimmer	Ceramic	Variable
C-55	E Band H.F. Osc. Padder	Mica	420 Mmf., 500 VDCW
C-56	E Band H.F. Osc. Padder	Ceramic	Variable
C-57	H.F. Osc. Plate Coupling	Mica	.001 Mfd., 300 VDCW
C-58	H.F. Osc. Grid Coupling	Ceramic	100 Mmf., 500 VDCW
C-59	B Supply Filter	Paper	.1 Mfd., 400 VDCW
C-60	A.V.C. Amp. Screen Bypass	Paper	.01 Mfd., 600 VDCW
C-61	A.V.C. Amp. Plate Filter	Paper	.05 Mfd., 600 VDCW
C-62	T-3 Tuning	Mica	510 Mmf., 500 VDCW
C-63	A.V.C. Amp. to A.V.C. Rectifier Coupling	Mica	.001 Mfd., 300 VDCW
C-64	S-Meter Bypass	Paper	.01 Mfd., 600 VDCW
C-65	A.V.C. Filter	Paper	.1 Mfd., 400 VDCW
C-66	A.V.C. Filter	Paper	.1 Mfd., 400 VDCW
C-67	C.W.O. Tuning	Air	Variable
C-68	C.W.O. Tuning	Mica	270 Mmf., 500 VDCW
C-69	C.W.O. Grid Coupling	Mica	270 Mmf., 500 VDCW
C-70	C.W.O. Screen Bypass	Paper	.1 Mfd., 400 VDCW
C-71	Det. Plate to C.W.O. Plate Coupling	Ceramic	10 Mmf.,
C-72	2nd. Det. Load	Mica	270 Mmf., 500 VDCW
C-73	Limiter Plate Filter	Paper	.1 Mfd., 400 VDCW
C-74	Audio Coupling	Paper	.1 Mfd., 400 VDCW
C-75	Tone Adjusting	Paper	.005 Mfd., 500 VDCW
C-76	1st. Audio Cathode Bypass	Elect.	10 Mfd., 50 VDCW
C-77	1st. Audio Screen Bypass	Paper	.25 Mfd., 400 VDCW
C-78	1st. Audio Plate Filter	Paper	.1 Mfd., 400 VDCW

PARTS LIST (Continued)

Symbol	*Function*	*Type*	*Rating*
	CAPACITORS (Continued)		
C-79	A.C. Line Bypass	Paper	0.01 Mfd., 600 VDCW
C-80	A.C. Line Bypass	Paper	0.01 Mfd., 600 VDCW
C-81	B plus Filter	Paper	.1 Mfd., 400 VDCW
C-82		Elect.	10+10 Mfd., 475 VDCW
C-82A	Power Supply Filter	Elect.	Part of C-82
C-82B	Power Supply Filter	Elect.	Part of C-82
C-83	B Minus Bypass	Elect.	25 Mfd., 50 VDCW
C-84	1st. Audio Coupling	Paper	.01 Mfd., 600 VDCW
C-85	2nd. Audio Input Coupling	Paper	.01 Mfd., 600 VDCW
C-86	2nd. Audio Input Coupling	Paper	.01 Mfd., 600 VDCW
C-87	V-13, V-14, Cathode Bypass	Elect.	25 Mfd., 50 VDCW
C-88	Audio Compensating	Mica	.001 Mfd., 500 VDCW
	RESISTORS		
R-1	Voltage Divider	Fixed	330 Ohms, 1/2 W.
R-2	Voltage Divider	Fixed	680 Ohms, 1/2 W.
R-3	Voltage Divider	Fixed	470 Ohms, 1/2 W.
R-4	S-Meter Adjusting	Fixed	220,000 Ohms, 1/2 W.
R-5	1st. R.F. Amp. Grid	Fixed	100,000 Ohms, 1/2 W.
R-6	1st. R.F. Amp. Screen Filter	Fixed	33,000 Ohms, 1/2 W.
R-7	1st. R.F. Amp. Plate Filter	Fixed	2,200 Ohms, 1/2 W.
R-8	2nd. R.F. Amp. Grid	Fixed	100,000 Ohms, 1/2 W.
R-9	2nd. R.F. Amp. Screen Filter	Fixed	33,000 Ohms, 1/2 W.
R-10	2nd. R.F. Amp. Plate Filter	Fixed	2,200 Ohms, 1/2 W.
R-11	Mixer Cathode	Fixed	220 Ohms, 1/2 W.
R-12	Mixer Screen Filter	Fixed	33,000 Ohms, 1/2 W.
R-13	Mixer Plate Filter	Fixed	2,200 Ohms, 1/2 W.
R-14	1st. I.F. Grid Filter	Fixed	470,000 Ohms, 1/2 W.
R-15	1st. I.F. Screen Filter	Fixed	33,000 Ohms, 1/2 W.
R-16	1st. I.F. Plate Filter	Fixed	2,200 Ohms, 1/2 W.
R-17	2nd. I.F. Screen Filter	Fixed	33,000 Ohms, 1/2 W.
R-18	2nd. I.F. Plate Filter	Fixed	2,200 Ohms, 1/2 W.
R-19	H.F. Osc. Grid	Fixed	22,000 Ohms, 1/2 W.
R-20	H.F. Osc. Plate	Fixed	47,000 Ohms, 1/2 W.
R-21	V.R. Dropping	Fixed	5,000 Ohms, 10 W.
R-22	A.V.C. Amp. Grid	Fixed	470,000 Ohms, 1/2 W.
R-23	R.F. Gain Control	Variable	10,000 Ohms, 1 ½ W.
R-24	Voltage Divider	Fixed	1,000 Ohms, 2 W.
R-25	Voltage Divider	Fixed	1,000 Ohms, 2 W.
R-26	A.V.C. Amp. Screen Filter	Fixed	100,000 Ohms, 1/2 W.
R-27	A.V.C. Amp. Plate Filter	Fixed	2,200 Ohms, 1/2 W.
R-28	A.V.C. Load	Fixed	33,000 Ohms, 1/2 W.
R-29	S-Meter Adjustment	Variable	2,000,000 Ohms,

PARTS LIST (Continued)

Symbol	*Function*	*Type*	*Rating*
	RESISTORS (Continued)		
R-30	S-Meter Adjusting	Fixed	150,000 Ohms, 1/2 W.
R-31	A.V.C. Voltage Divider	Fixed	470,000 Ohms, 1/2 W.
R-32	A.V.C. Voltage Divider	Fixed	470,000 Ohms, 1/2 W.
R-33	A.V.C. Voltage Divider	Fixed	270,000 Ohms, 1/2 W.
R-34	A.V.C. Voltage Divider	Fixed	220,000 Ohms, 1/2 W.
R-35	C.W. Osc. Grid Bias	Fixed	47,000 Ohms, 1/2 W.
R-36	C.W. Osc. Screen Filter	Fixed	100,000 Ohms, 1/2 W.
R-37	C.W. Osc. Screen Bleeder	Fixed	100,000 Ohms, 1/2 W.
R-38	C.W. Osc. Plate	Fixed	220,000 Ohms, 1/2 W.
R-39	Limiter Control	Variable	100,000 Ohms,
R-40	2nd. Det. Load	Fixed	68,000 Ohms, 1/2 W.
R-41	Limiter Plate Filter	Fixed	270,000 Ohms, 1/2 W.
R-42	Limiter Load	Fixed	270,000 Ohms, 1/2 W.
R-43	Tone Control	Variable	500,000 Ohms,
R-44	Audio Gain Control	Variable	500,000 Ohms,
R-45	1st. Audio Cathode	Fixed	2,200 Ohms, 1/2 W.
R-46	Inverse Feedback Voltage Divider	Fixed	100 Ohms, 1/2 W.
R-47	Inverse Feedback Voltage Divider	Fixed	4,700 Ohms, 1/2 W.
R-48	1st. Audio Screen Filter	Fixed	1,000,000 Ohms, 1/2 W.
R-49	1st. Audio Screen Bleeder	Fixed	470,000 Ohms, 1/2 W.
R-50	1st. Audio Plate Load	Fixed	100,000 Ohms, 1/2 W.
R-51	1st. Audio Plate Filter	Fixed	47,000 Ohms, 1/2 W.
R-52	Phase Inverter Grid	Fixed	470,000 Ohms, 1/2 W.
R-53	Phase Inverter Cathode Bias	Fixed	4,700 Ohms, 1/2 W.
R-54	Phase Inverter Cathode Load	Fixed	47,000 Ohms, 1/2 W.
R-55	Phase Inverter Plate Load	Fixed	47,000 Ohms, 1/2 W.
R-56	V-14 Grid	Fixed	270,000 Ohms, 1/2 W.
R-57	V-13 Grid	Fixed	270,000 Ohms, 1/2 W.
R-58	V-13 & V-14 Cathode Bias	Fixed	330 Ohms, 2 W.
R-59	Headphone Load	Fixed	470 Ohms, 2 W.
	MISCELLANEOUS		
CF-1	Crystal Filter		455 Kc.
F-1	A.C. Line Fuse		2 Amp., 250 Volts
I-1	S-Meter Lamp	No. 47	0.15 Amp., 6-8 Volts
I-2	Dial Lamp	No. 47	0.15 Amp., 6-8 Volts
I-3	Dial Lamp	No. 47	0.15 Amp., 6-8 Volts
J-1	Phono Jack		Single-Circuit
J-2	Phones Jack		Multi-Circuit
L-1	1st. R.F. Amp. Inductor	A Band	
L-2	1st. R.F. Amp. Inductor	B Band	
L-3	1st. R.F. Amp. Inductor	C Band	
L-4	1st. R.F. Amp. Inductor	D Band	

PARTS LIST (Continued)

Symbol	*Function*	*Type*	*Rating*
	MISCELLANEOUS (Continued)		
L-5	1st. R.F. Amp. Inductor	E Band	
L-6	2nd. R.F. Amp. Inductor	A Band	
L-7	2nd. R.F. Amp. Inductor	B Band	
L-8	2nd. R.F. Amp. Inductor	C Band	
L-9	2nd. R.F. Amp. Inductor	D Band	
L-10	2nd. R.F. Amp. Inductor	E Band	
L-11	1st. Det. Inductor	A Band	
L-12	1st. Det. Inductor	B Band	
L-13	1st. Det. Inductor	C Band	
L-14	1st. Det. Inductor	D Band	
L-15	1st. Det. Inductor	E Band	
L-16	CF-1 Input Tuning	Variable	Iron-Core Inductor
L-17	CF-1 Output Tuning	Variable	Iron-Core Inductor
L-18	T-1 Input Tuning	Variable	Iron-Core Inductor
L-19	T-1 Output Tuning	Variable	Iron-Core Inductor
L-20	T-2 Input Tuning	Variable	Iron-Core Inductor
L-21	T-2 Output Tuning	Variable	Iron-Core Inductor
L-22	H.F. Osc. Inductor	A Band	
L-23	H.F. Osc. Inductor	B Band	
L-24	H.F. Osc. Inductor	C Band	
L-25	H.F. Osc. Inductor	D Band	
L-26	H.F. Osc. Inductor	E Band	
L-27	T-3 Tuning	Variable	Iron-Core Inductor
L-28	T-4 Tuning	Variable	Iron-Core Inductor
L-29	Filter Choke	No. 80	17 Henries
M-1	Signal Strength Meter	S-Meter	
P-1	A.C. Line Cord and Plug		2 Contact
P-2	A.C. Jumper Plug	Octal	
S-1		Rotary	D.P. 5 Position
S-1A	Gain Adjustment		S.P. 5 Position
S-1B	S-Meter Adjustment		S.P. 5 Position
S-2	1st. R.F. Transformer Band Switch	Rotary	D.P. 5 Position
S-2A			S.P. 5 Position
S-2B			S.P. 5 Position
S-3	1st. R.F. Transformer Band Switch	Rotary	D.P. 5 Position
S-3A			S.P. 5 Position
S-3B			S.P. 5 Position
S-4	2nd. R.F. Transformer Band Switch	Rotary	D.P. 5 Position
S-4A			S.P. 5 Position
S-4B			S.P. 5 Position
S-5	2nd. R.F. Transformer Band Switch	Rotary	D.P. 5 Position
S-5A			S.P. 5 Position
S-5B			S.P. 5 Position

PARTS LIST (Continued)

Symbol	*Function*	*Type*	*Rating*
	MISCELLANEOUS (Continued)		
S-6	1st. Det. Trans. Band Switch	Rotary	D.P. 5 Position
S-6A			S.P. 5 Position
S-6B			S.P. 5 Position
S-7	1st. Det. Trans. Band Switch	Rotary	D.P. 5 Position
S-7A			S.P. 5 Position
S-7B			S.P. 5 Position
S-8	Selectivity Control Switch	Rotary	D.P. 6 Position
S-9	H.F. Osc. Band Switch	Rotary	D.P. 5 Position
S-9A			S.P. 5 Position
S-9B			S.P. 5 Position
S-10	H.F. Osc. Band Switch	Rotary	D.P. 5 Position
S-10A			S.P. 5 Position
S-10B			S.P. 5 Position
S-11	A.V.C. Switch	Toggle	S.P.S.T.
S-12	C.W. Osc. Switch	Rotary	S.P.D.T.
S-13	Limiter Switch		S.P.D.T.
S-14	Radio-Phono Switch	Toggle	D.P.D.T.
S-15	A.C. Line Switch		S.P.S.T.
S-16	Send-Receive Switch	Toggle	S.P.S.T.
T-1	2nd. I.F. Transformer		455 Kc.
T-2	Det. Input Transformer		455 Kc.
T-3	A.V.C. Amp. Transformer		
T-4	C.W. Osc. Transformer		455 Kc.
T-5	Power Transformer		
T-6	Audio Output Transformer		
V-1	1st. R.F. Amp.	6SG7	
V-2	2nd. R.F. Amp.	6SG7	
V-3	Mixer	6SA7	
V-4	H.F. Osc.	6J5	
V-5	1st. I.F. Amp.	6SG7	
V-6	2nd. I.F. Amp.	6SG7	
V-7	2nd. Det.-A.V.C. Det.	6H6	
V-8	A.V.C. Amp.	6AC7	
V-9	C.W. Osc.	6SJ7	
V-10	Noise Limiter	6H6	
V-11	First Audio	6SJ7	
V-12	Phase Inverter	6J5	
V-13	Audio Output	6V6GT/G	
V-14	Audio Output	6V6GT/G	
V-15	Voltage Regulator	OD3/VR-150	
V-16	Rectifier	5U4G	
X-1	Battery Socket	Octal	
X-2	Accessory Connector Socket	Octal	
X-3	Output Socket	Three Pin	
Y-1	Crystal Resonator		455 Kc.

SECTION 6. ALIGNMENT DATA

6-1. *General*

All circuits in the NC-183 Receiver are carefully aligned, before shipment, using precision test equipment insuring close conformability to the alignment frequency. No realignment of the various adjustments will be required, therefore, unless the Receiver is tampered with or damaged in transit.

The necessity for any realignment can be determined by checking the performance of the Receiver against its normal operation as outlined in Section 3. In no case should realignment be attempted unless tests indicate that such realignment is necessary. Even then, it must be remembered that the NC-183 is a communications Receiver and should not be serviced or realigned by any individual who does not have a complete understanding of the functioning of the equipment and who has not had previous experience adjusting a similar type of Receiver.

Before proceding with the alignment of any circuit in the Receiver, the equipment must be set up as specified in Section 2-3, except that the antenna lead-in and loudspeaker must be disconnected. An output meter having an 8 or 500 ohm resistive load should be connected to the matching terminal on the Receiver's output socket. If it is so desired a high-impedance A.C. voltmeter may be connected to the phone output jack and used in place of the output meter.

Alignment of the equipment may be divided into two major steps:

(1) I.F. and A.V.C. Amplifier Alignment.

(2) General Coverage and Bandspread Alignment.

(a) H.F. Oscillator

(b) First Detector and R.F. Amplifiers

The circuits must be tuned in the above order when complete alignment is required.

6-2. *I.F. and A.V.C. Amplifier Alignment*

The intermediate frequency of the NC-183 Receiver is 455 kilocycles, plus or minus 2 kilocycles. The exact frequency is determined by the quartz crystal resonator Y-1.

The I.F. transformers, crystal filter, A.V.C. amplifier and C.W. oscillator transformers all have individual permeability-tuned iron core inductors with screw-type adjustments for alignment purposes. These adjustments are located on Figure No. 5.

The preliminary alignment procedure is as follows:

(1) Connect the high output lead of an accurately calibrated signal generator to the stator portion of the detector section of the main tuning capacitor C-3C and the grounded lead to any convenient grounded point on the chassis. This is a direct connection, no dummy antenna being required.

(2) Set the C.W.O. switch at ON.

(3) Set the A.V.C. switch at M.V.C.

(4) Set the PHASING control at 0.

(5) Set the SELECTIVITY control at 5.

(6) Set the A.F. GAIN control at 10.

(7) Set the R.F. GAIN control at 10.

(8) Turn the modulation of the signal generator off to provide a steady C.W. test

signal.

Adjust the output attenuator of the signal generator to provide a signal of approximately 100 microvolts and vary the tuning control of the signal generator slowly between the frequencies of 453 and 457 kilocycles. At some frequency between these limits the I.F. amplifier of the Receiver will show a very sharply peaked response, as indicated on the output meter. This frequency is that of the crystal, Y-1, and I.F. alignment, as outlined below, is made to this frequency. The C.W.O. control must be set to provide an audible beat note; the presence of this beat note can readily be determined by temporarily connecting headphones or a loud-speaker to the Receiver.

While making I.F. amplifier adjustments, it will be necessary to retard the attenuator of the signal generator if I.F. amplifier gain increases to a point where overload occurs. Without altering the frequency setting of the signal generator set the SELECTIVITY and C.W.O. switches at OFF, and turn the modulation of the signal generator ON. The I.F. tuned inductors L-16 through L-21 should, at this point, each be carefully adjusted to give a maximum reading on the output meter. The order in which these adjustments are made is not important.

To align the A.V.C. amplifier turn the A.V.C.-M.V.C. switch to A.V.C. Adjust L-27 of transformer T-3 until a well-defined dip is observed in the output meter readings. The setting of L-27 where this dip occurs will provide maximum A.V.C. action.

Turn the modulation of the signal generator OFF and turn the C.W.O. switch ON and set the C.W.O. control at 0 at which setting the C.W. oscillator should be at zero beat with the test signal. If zero beat does not occur at 0, readjust the tuneable inductor L-28, of transformer T-4 until zero beat does occur with the C.W.O. control set at 0.

6-3. *General Coverage and Bandspread Alignment*

The data given in this section applies to the alignment of the H.F. oscillator, first detector and R.F. amplifier stages. Since the main tuning capacitor and bandspread capacitor are connected in parallel on all bands General Coverage and Bandspread alignment are accomplished simultaneously. The 6 meter band, A, is tuneable by Bandspread tuning only.

The original alignment at National Laboratories is accomplished by the use of precision crystal-controlled test oscillators. No realignment of bands B, C, D and E should be attempted unless a test signal source with an accuracy of better than 1% is available. For band A, 6 meters, the test signal source must have the accuracy of precision calibrated crystals.

The need for realignment of the H.F. oscillator of bands B, C, D or E is indicated when the frequency calibration of the Receiver is in error by more than 2% at the high frequency end of any one band. Realignment of the H.F. oscillator of band A is indicated by a calibration error of 0.01%. Particular care should be taken when adjusting the high frequency oscillator trimmers. It is imperative that the high frequency oscillator is set to operate at a frequency above the first detector and R.F. amplifier frequency and not below. This can be checked by tuning in the image signal which should appear 910 kilocycles lower on the receiver dial. If it is found that the image signal does not appear at this setting the H.F. oscillator is incorrectly adjusted and the capacity of the H.F. oscillator trimmer must be decreased until the image and fundamental signals appear at the correct setting. Bands B, C and D each have an inductance adjustment, L-23, L-24, L-25, and Band E has a variable capacitor, C-56, for H.F. Oscillator alignment at the low frequency check point of these bands. After the H.F. oscillator is correctly calibrated the first detector and R.F. amplifier trimmers should be adjusted for maximum receiver gain as indicated on the output meter.

Correction of tracking errors of the first detector and R.F. amplifier stages at the low frequency check point of bands B, C and D is accomplished by the adjustments listed on the Alignment Chart. The tracking of the first detector and second R.F. amplifier stages may be checked by inserting a tuning wand into the opening of the coil form under test. Receiver gain should decrease the same amount on insertion of the iron or brass end of the tuning wand.

The tracking of the first R.F. amplifier stage of bands B, C and D may be checked by rotating the TRIMMER control, C-2. If two definite peaks in output are observed, while rotating the TRIMMER control, the first R.F. amplifier stage is tracking correctly and the TRIMMER setting at either peak is correct. The lack of a peak in output or the presence of only one peak indicates the stage is not tracking properly and correction should be made.

The locations of the adjustments referred to on the Alignment Chart are shown on Figure No. 7.

The control settings used for alignment are as outlined in Section 3-2 except that the A.V.C.-M.V.C. switch should be at M.V.C. The following Alignment Chart gives the step by step procedure to follow in effecting alignment of each band. It is important that the chart of adjustments is adhered to in the order shown for each band.

ALIGNMENT CHART

Step	Band	Adjust Signal Source To:	Set Gen. Cov. Dial At:	Set Bandspread Dial At:	Adjust To Receive Test Signal	Adjust For Maximum Output
1	A	56 Mc.	⑥ (at 198 on linear scale)	56 Mc.	C-47	C-18, C-9, C-2
1	B	30.0 Mc.	30.0 Mc.	Set Mark	C-48	C-19, C-11, C-2
2	B	14.0 Mc.	14.0 Mc.	Set Mark	L-23	L-12, L-7, L-2
3	B	30.0 Mc.	30.0 Mc.	Set Mark	C-48	Check Step 1. Repeat Steps 1, 2 and 3 if necessary.
1	C	11.0 Mc.	11.0 Mc.	Set Mark	C-50	C-20, C-12, C-2
2	C	5.0 Mc.	5.0 Mc.	Set Mark	L-24	L-13, L-8, L-3
3	C	11.0 Mc.	11.0 Mc.	Set Mark	C-50	Check Step 1. Repeat Steps 1, 2 and 3 if necessary.
1	D	4.0 Mc.	4.0 Mc.	Set Mark	C-52	C-21, C-13, C-2
2	D	1.8 Mc.	1.8 Mc.	Set Mark	L-25	L-14, L-9, L-4
3	D	4.0 Mc.	4.0 Mc.	Set Mark	C-52	Check Step 1. Repeat Steps 1, 2 and 3 if necessary.
1	E	1.5 Mc.	1.5 Mc.	Set Mark	C-54	C-22, C-14, C-2
2	E	0.6 Mc.	0.6 Mc.	Set Mark	C-56	
3	E	1.5 Mc.	1.5 Mc.	Set Mark	C-54	Check Step 1. Repeat Steps 1, 2 and 3 if necessary.

NOTE: Inductance adjustments (indicated by "L-") consist of a loop of wire inside coil form--berding the loop one way or the other adds or subtracts to the inductance.

The Set Mark referred to above is located at 180 on the linear scale.

Standard Form Warranty

Adopted by the Radio Manufacturers Association, Inc.

This equipment is warranted to be free from defective material and workmanship and repair or replacement will be made of any part which under normal installation, use and service discloses defect, provided the unit is delivered by the owner to the manufacturer or through the authorized radio dealer or wholesaler from whom purchased, intact, for examination, with all transportation charges prepaid to the factory, within ninety days from the date of original shipment from the factory, and provided that such examination discloses in the manufacturer's judgment that it is thus defective.

This warranty does not extend to any radio products which have been subjected to misuse, neglect, accident, incorrect wiring, improper installation, or to use in violation of instructions furnished by the manufacturer, nor extend to units which have been repaired or altered outside of the factory, nor to cases where the serial number thereof has been removed, defaced or changed, nor to accessories used therewith of other manufacture.

Any part of a unit approved for remedy or exchange hereunder will be remedied or exchanged by the authorized radio dealer or wholesaler without charge to the owner.

This warranty is in lieu of all other warranties expressed or implied and no representative or person is authorized to assume for the manufacturer any other liability in connection with the sale of their radio products.

National Company, Inc. reserves the right to make any change in design or to make addition to, or improvements in, its products without imposing any obligations upon itself to install them in its products previously manufactured.

THE NATIONAL NC-183 RECEIVER

Price List

NC-183T RECEIVER, table mounting, gray finish, complete with tubes, crystal filter, noise limiter, 115 and 230 volt, 50/60 cycle built-in power supply.

NC-183TS 10″ PM Loudspeaker in matching cabinet for the above Receiver.

NC-183R RECEIVER, same as table model but mounted on ⅛″ aluminum standard rack panel, 10½″ high, black wrinkle finish.

NC-183RS 10″ PM Loudspeaker mounted on ⅛″ aluminum standard rack panel, 10½″ high, black wrinkle finish.

Prices on Application

National Co., Inc., Malden, Mass., U. S. A.

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